Other Diving Maladies

Presented by the NOAA Diving Center
Seattle, Washington

Global View

- Vertigo
- Otitis externa
- Otitis media
- Methods of heat loss
- Hypothermia
- Hyperthermia

Vertigo--1

- On land divers use a combination of vision, the feeling of gravity, and the inner ear to tell them which way is up
- Underwater, divers become weightless, depriving themselves of the sensation of gravity and making them reliant on vision and the balance organs of the body for spatial orientation
- Poor visibility forces the diver to be totally reliant upon their body's balance organs

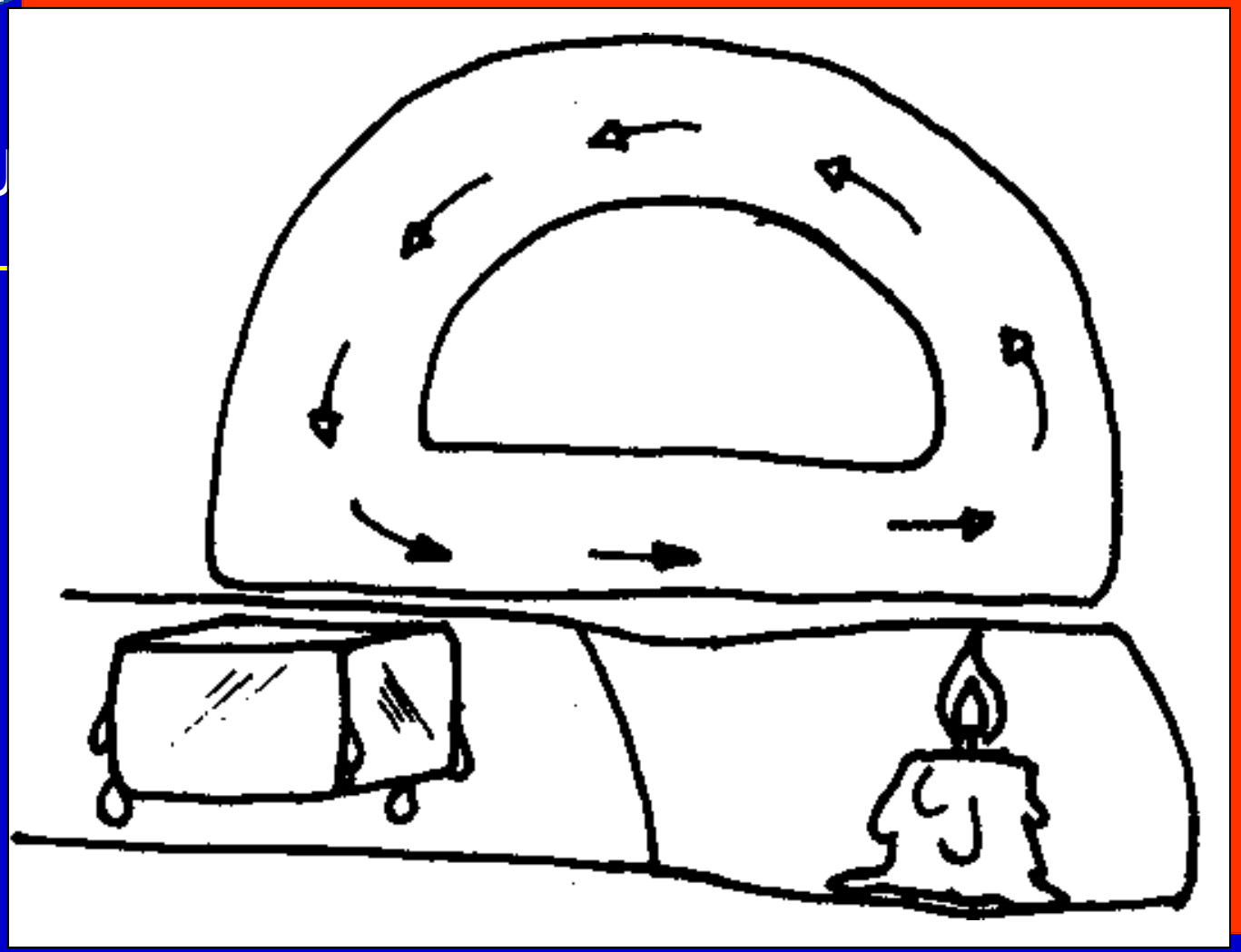
Vertigo--2

- Definition: Vertigo, or “dizziness,” is the false sense of spinning or movement - be it the sensation of the diver him/herself spinning or the spinning of the environment around them
- Cause: The balance organs of the body provide the brain misleading information which is falsely interpreted as movement
- Concern: Can lead to nausea and/or vomiting which if occurs underwater can be life-threatening for a diver

Causes of Vertigo-1

- U

ter



Causes of Vertigo-2

- Unequal vestibular stimulation, cont.:
  - Middle or inner ear barotrauma affecting one side
  - Decompression sickness on one side
  - Alternobaric vertigo: failure of the ears to equalize pressure to the same degree stimulates the vestibular system unequally
    - Normally occurs on ascent as pressure in the middle ear spaces becomes greater on one side due to differences in patency of the Eustachian tubes
    - Common occurrence which resolves after equalizations of the blocked middle ear

Causes of Vertigo-3

- Other causes of vertigo:
  - Deprivation of normal visual cues in conditions of poor visibility, blue-water (over-bottom) diving, or at night
  - Nitrogen narcosis may intensify vertigo
  - Gas toxicity (i.e. oxygen, carbon dioxide, carbon monoxide)
  - High pressure nervous syndrome (HPNS)
- What to do in the case of vertigo?
  - Avoid unnecessary movement
  - Hold onto a fixed object if available
  - Notify dive buddy of problem
  - If condition continues, cautiously inflate BC and return to surface
  - Discontinue diving until cause is corrected

Ear Infections

Otitis Externa-1

- Definition: Infection of outer ear canal caused by bacteria and/or fungi.
- Cause: The infection is usually brought on by water in the ear canal and may be precipitated by injury to the ear canal due to scratching (matches, hair pins, or removal of the protective wax lining the canal)
- Signs and Symptoms:
  - Mild infection: Itching
  - Serious infection:
    - Local boil in the ear canal
    - Inflammation with narrowing of canal
    - Offensive smelling discharge
    - Pain with movement
    - Mild hearing loss

Otitis Externa-2

- Treatment:
  - Do not clean or scratch ear canal
  - Do not wash ears or allow water to enter ear canals
  - Mild cases may require topical antibiotic and steroid ear drops
  - In addition to topical antibiotics and steroid ear drops, severe cases may also require pain medication
- Prevention:
  - Treat ear canals with several drops of a 5% acetic acid in 85% isopropyl domeporo alcohol solution after exposure to water
  - Allow drops to remain in ear canal for 1 full minute before draining
  - Never insert anything in ear canal smaller than your elbow

Otitis Media

- Definition: Infection of middle ear space caused by bacteria and/or fungi
- Cause: The infection is usually brought on by barotrauma or following upper respiratory tract infections or allergies
- Mode of transmission:
  - Via eustachian tube
  - Perforated or traumatized eardrum
- Signs and symptoms:
  - Pain or ringing in ear
  - Fever
  - Slight hearing loss
  - Tenderness
  - Heat
  - Itching
- Treatment: Typically requires oral broad spectrum antibiotics and analgesic amoxicilon medication for pain

Thermal Concerns

Heat Transfer and Loss

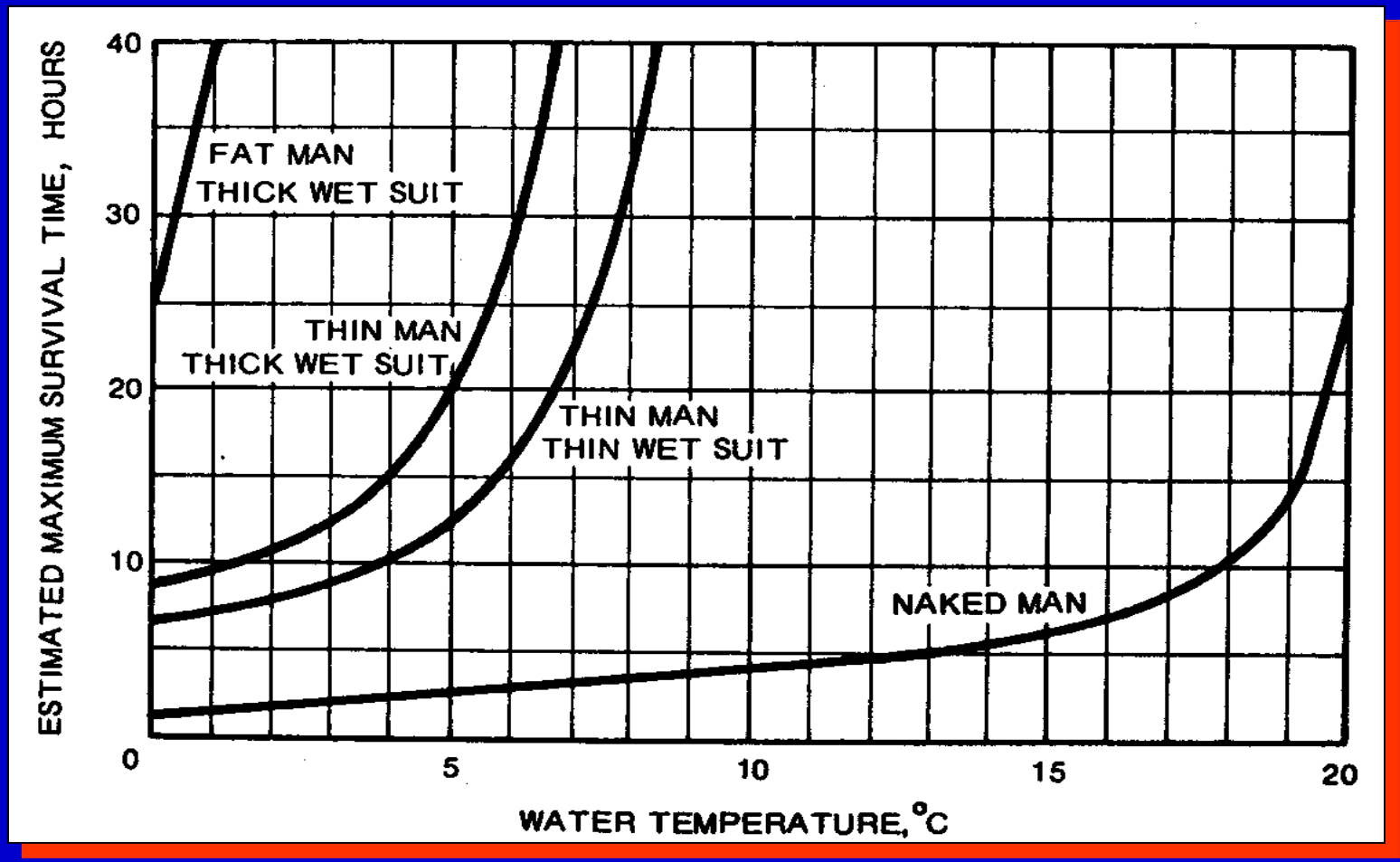
- Convection:
  - Heat warms surrounding fluid which rises and is replaced by cooler fluid
- Conduction:
  - Heat lost through direct physical contact. Water conducts 24 times faster than air!
- Respiration:
  - Heat added to air in the lungs is lost with exhalation
- Radiation:
  - Heat waves radiate to surrounding objects without physical contact
- Evaporation:
  - Perspiration cools when it changes from a liquid to a vapor

Hypothermia-1

- Definition: Below normal body core temperature
- Cause: Inadequate body insulation
- Signs & symptoms: See chart
- Prevention: Insulate; stop diving when cold and shivering

98°	Stage 1: Shivering
95°	Stage 2: Confused, muscle rigidity, no shivering
90°	Stage 3: Decreased LOC, dilated pupils
86°	Stage 4: Decreased vital signs
82°	Stage 5: Cyanosis, death likely

Hypothermia-2



Hypothermia-3

- Treatment:
  - Handle patient gently! No tugging, massaging, exercising
  - Move patient to warm location
  - Remove wet clothing & dry patient
  - Treat for shock
  - Insulate patient (including head and neck)
  - Breathing warm air or oxygen helps
  - Re-warm core areas - armpit, groin, neck
  - Conscious patients may drink warm, nonalcoholic, noncaffeinated drinks
  - If condition severe, follow-up with medical care

Hyperthermia-1

- Definition: Above normal body core temperature
- Types: See boxes
- Causes: Exertion, heat, excess insulation
- Signs & symptoms: See charts
- Prevention: Minimize exertion, keep cool

Heat Exhaustion:
- Normal body temperature
- Sweating
- Cool, clammy skin
- Dizziness & nausea

Heat Stroke:
- High body temperature
- Dry skin (usually)
- Hot, red skin
- Semi- or unconscious

Hyperthermia-2

- Signs & symptoms:
  - Heat exhaustion:
    - Pale skin
    - Weakness
    - Heavy sweating
    - Usually conscious
  - Heat stroke:
    - Flushed, hot, dry skin
    - Usually unconscious
- Treatment:
  - Move victim to cool location
  - Remove excess clothing
  - Apply cool, wet cloths & fan
  - Allow conscious patient to drink water
  - Seek medical attention immediately for heat stroke & in 30 minutes if no improvement in heat exhaustion

Key Points

- Two common types of vertigo are: caloric and alternobaric
- Otitis external is a bacterial or fungal infection of the outer ear - otitis media is a bacterial infection of the middle ear
- Most common methods of heat loss for fully-dressed divers are conduction and respiration
- Severe hypothermia and heat stroke are both life-threatening conditions